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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/542,061	04/03/2000	Erik R. Thoen	01997-270001	4229

7590 12/20/2001

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EXAMINER
MENEFEE, JAMES A

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 12/20/2001

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/542,061	THOEN ET AL.	
	Examiner	Art Unit	
	James Menefee	2881	

-- The MAILING DATE of this communication appears on the c ver sheet with the correspondence address --

P riod for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 October 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Response to Amendment

The affidavit filed on 9 October 2001 under 37 CFR 1.131 is sufficient to overcome the Jiang (Optics Letters, Aug. 1999) reference.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 8, 10-11, 26-30, are rejected under 35 U.S.C. 102(b) as being anticipated by Spuhler (Electronics Letters, 1 April 1999). Relevant portions of Spuhler are the entire document, especially Fig. 1-2. See the marked up copies of Fig. 1-2 at the end of this action to go along with the reference numbers mentioned below.

Independent Claims

Regarding claim 1, Spuhler discloses a laser system 10 that produces radiation at an operative wavelength, the system defining a laser cavity. The system comprises a mode-locking element 20 configured to mode-lock the output of the laser system, and a semiconductor element 30.

Regarding claim 10, there is disclosed a laser system 10 defining a laser cavity and comprising a pump 11, a gain medium 12 that produces radiation when pumped by the pump 11, and a reflector 13 disposed along an optical path in the cavity, the

reflector comprising one or more layers of a 1st semiconductor material 20 acting as saturable absorber, and one or more layers of a 2nd semiconductor material 30.

Regarding claim 26, there is disclosed a method of enhancing the stability of a cw mode-locked output of a laser 10, the method comprising passively mode-locking the output of a laser 10 to achieve a continuous train of pulses and stabilizing the pulses by incorporating a semiconductor element 30.

It is not explicitly disclosed that the semiconductor element of these claims produces nonlinear increasing loss, but when the structure recited in the prior are is substantially identical to that shown in the claims, claimed properties or functions are presumed to be inherent. As the structures are the same, it is presumed that the semiconductor element will produce nonlinear loss.

Dependent Claims

Regarding claims 2, 11, and 29, it is not explicitly disclosed that the semiconductor element exhibits two-photon absorption, but when the structure recited in the prior are is substantially identical to that shown in the claims, claimed properties or functions are presumed to be inherent. As the structures are the same, it is presumed that the semiconductor element will exhibit two-photon absorption.

Regarding claims 3 and 30, there is further disclosed a reflective structure 13 disposed along an optical path in the cavity, where the semiconductor element 30 comprises one or more layers of the material disposed on the reflective element.

Regarding claims 8 and 28, the mode-locking element 20 is a saturable absorber that passively mode-locks the system.

Regarding claim 27, the stabilizing step includes stabilizing the continuous train against Q-switched mode locking (p. 568, col. 2, 1st new par.).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4-5 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spuhler in view of Kosah (US H1177). Spuhler discloses all of the limitations of claims 1, 3, and 26, but does not mention that the semiconductor material exhibits sufficient free carrier absorption to produce nonlinear increasing loss. Kosah teaches that free carrier absorption is a cause of non-linear effects in an optical system (col. 2 lines 31-62). It would have been obvious to one skilled in the art to have semiconductor material that initiates free carrier absorption so that the optical nonlinear effects (i.e. nonlinear increasing loss) that are inherently present in Spuhler can be controllable, as taught by Kosah.

Claims 6 and 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spuhler. Spuhler discloses the limitations of claims 1-3, 8, 10-11, and 26-30, but does not disclose the following:

Regarding claims 6 and 19, it is not disclosed that the semiconductor layer be part of a transmissive structure, or more particularly a reflector having a resonant or AR coating. It would have been obvious to one skilled in the art to include an AR coating on the reflector, and therefore make the semiconductor layer part of a transmissive structure, in order to help reduce loss caused by feedback in the cavity due to unwanted reflection on that end of the reflector, as is well known.

Regarding claim 15, it is not disclosed that the 2nd semiconductor be InP, rather that it should be GaAs. However, InP and GaAs are art known substitutes as using one or the other will not significantly change the operation of the device, therefore it would have been an obvious substitution for one skilled in the art to use InP over GaAs.

Regarding claim 16, it is disclosed that the 1st semiconductor (i.e. the quantum wells of Fig. 1) comprises InGaAs.

Regarding claim 17, the gain medium is an Er/Yb waveguide (title, abstract).

Regarding claim 18, it is disclosed that the reflector comprises a Bragg mirror, rather than a dielectric mirror. However, these items are art known substitutes as using either will not significantly change the overall operation of the device, therefore it would have been an obvious substitution for one skilled in the art to use a dielectric mirror rather than a Bragg mirror.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Spuhler in view of Jacobovitz-Veselka (US 5,278,855). Spuhler discloses all of the limitations of claim 1, but does not mention that the system is tunable to produce radiation over a range of wavelengths. Jacobovitz-Veselka teaches that it is known to produce mode locked lasers in tunable systems (col. 3 lines 17-38). It would have been obvious to one skilled in the art to make the system tunable as it is often important to be able to change the lasing wavelength over a range of wavelengths, as is well known.

Claims 9, 20-25, and 32-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spuhler in view of Shen (US 5,764,679).

Independent Claims

Regarding claim 20, Spuhler discloses a laser system 10 comprising a pump 11, a gain medium 12 that produces radiation when pumped by the pump, a mode-locking element 20, and a structure disposed along the optical path of the cavity comprising a semiconductor material.

Regarding claim 32, Spuhler discloses a method comprising mode-locking a laser to produce a train of pulses, and incorporating a semiconductor element into the cavity of the laser limiting peak intensity of the pulses.

It is not explicitly disclosed that the semiconductor element of these claims produces nonlinear increasing loss, but when the structure recited in the prior are is substantially identical to that shown in the claims, claimed properties or functions are

presumed to be inherent. As the structures are the same, it is presumed that the semiconductor element will produce nonlinear loss.

It is not disclosed the use of active mode locking rather than passive mode locking. Shen teaches that active mode locking is conventionally done using an outside modulation source, and also that active mode locking can generate pulses with small timing jitter (col. 1 lines 14-40). It would be obvious to one skilled in the art to use active mode locking rather than passive mode locking because of the smaller jitter obtained, as taught by Shen.

Dependent Claims

Regarding claim 9, it is not disclosed that the mode locking element performs active mode-locking. Shen teaches that active mode locking is conventionally done using an outside modulation source, and also that active mode locking can generate pulses with small timing jitter (col. 1 lines 14-40). It would have been obvious to one skilled in the art to use active mode locking rather than passive mode locking because of the smaller jitter obtained, as taught by Shen.

Regarding claim 21, it is not explicitly disclosed that the semiconductor element exhibits two-photon absorption, but when the structure recited in the prior are is substantially identical to that shown in the claims, claimed properties or functions are presumed to be inherent. As the structures are the same, it is presumed that the semiconductor element will exhibit two-photon absorption.

Regarding claim 22, it is disclosed that the semiconductor material is part of a reflector.

Regarding claim 23, it is disclosed that the structure comprises a waveguide.

Regarding claim 24, it is disclosed that the structure comprises a waveguide.

Regarding claim 25, it is not disclosed that the semiconductor material comprise InP or that the semiconductor material be an Er doped fiber. It is disclosed that the laser comprise Er doped glass and the semiconductor material comprise GaAs. These two pairs each contain art known substitutes as using one or the other will not significantly change the operation of the device, therefore it would have been an obvious substitution for one skilled in the art to use InP over GaAs and Er doped fiber over Erd oped glass.

Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spuhler in view of Feuer (US 6,078,597). Spuhler discloses all of the limitations of claims 10-11 but does not mention that when light is incident on the reflector a standing wave is formed, said standing wave having local maximum in the first or second semiconductor layers. Feuer teaches a reflector with a saturable medium adjacent to it, similar to Spuhler's. When light is incident on the reflector a standing wave is formed with local maxima in the saturable absorption area (col. 2 lines 12-24, col. 3 lines 40-51). It would have been obvious to one skilled in the art to include such a reflector in Spuhler's system because a reflector that produces local maxima in such a way can help to eliminate noise, as taught by Feuer. It would be obvious to one skilled in the art that should Feuer include a second semiconductor section then the maximum may be located in that area for the same reasons.

Response to Arguments

There were no arguments made, only the filing of the affidavit.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jiang (US 6,252,892) discloses everything that the previously cited Jiang reference disclosed, only the priority date is earlier.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James Menefee whose telephone number is (703) 605-4367. The examiner can normally be reached on M-F 8:30-5.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Primary Examiner
for
SPE Paul Dzierzynski

JM
December 12, 2001

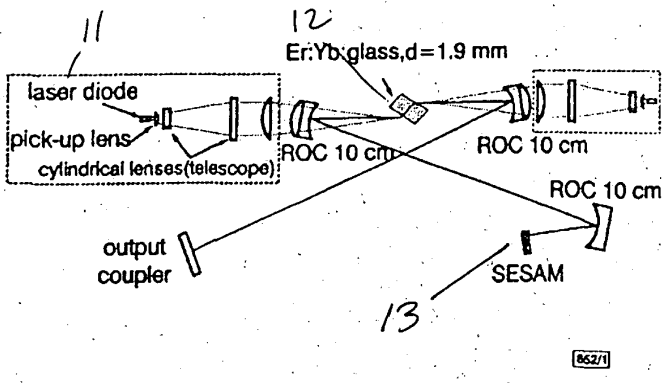

Fig. 1 *Diode-pumped Er^{3+}:Yb^{3+}:glass cavity setup*

The arm lengths of the delta cavity are 50cm and 65cm from the folding mirrors to the output coupler and the SESAM, respectively (ROC: radius of curvature; SESAM: semiconductor saturable absorber mirror)

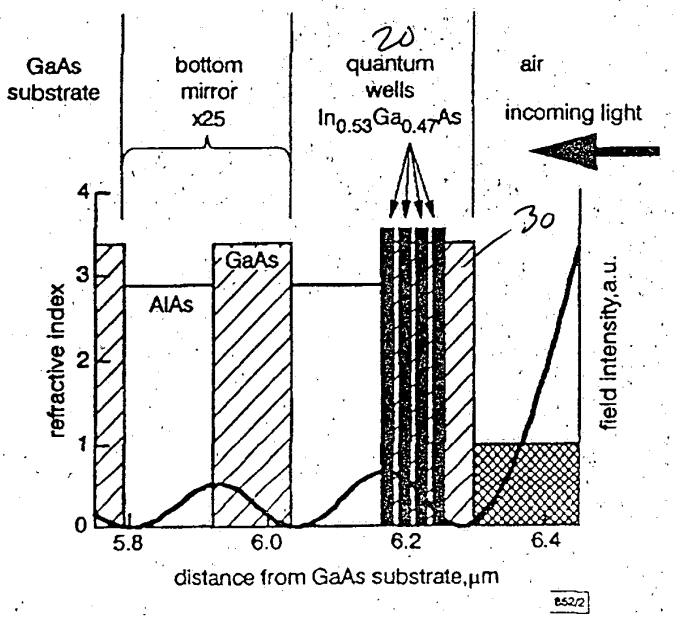

Fig. 2 *Semiconductor saturable absorber mirror (SESAM) design with highly strained InGaAs quantum wells and standing wave pattern of the optical field in the structure*